You are responsible, forever, for what you have tamed.
You are responsible for your rose.
Antoine de Saint-Exupéry

AIR POLLUTION

Underground Fires Surface

Uncontrolled fires burning in underground and surface coal deposits in numerous countries, including China, India, and Indonesia, are emitting large amounts of greenhouse gases and other pollutants into the atmosphere. These pollutants may pose other grave environmental hazards. In China alone, about 120 million tons of coal are consumed in uncontrolled fires each year, says Andries Rosema, director of the Environmental Analysis and Remote Sensing Company in Delft, The Netherlands. Rosema extrapolated this estimate from temperature measurements—collected by satellites and low-flying airplanes—which indicate that about 300,000 metric tons of coal spread over thousands of kilometers burn each year in just one province in northern China, Ningxia. Says Rosema, "These coal fires that are burning around the world are really an environmental catastrophe . . . and hardly anybody has taken an interest in studying it."

One of the most troubling results of these fires, he says, is the carbon dioxide (CO_2) they generate, including about 360 million metric tons of CO_2 from coal fires in China alone. "The CO_2 production of all of these fires in China is more than the total CO_2 production in The Netherlands," Rosema says. This amounts to 2–3% of the annual worldwide production of CO_2 from fossil fuels, or as much as emitted from all of the cars and light trucks in the United States. "Coal fires release a variety of potentially harmful gases [and] combustion by-products, including sulfur and particulates," says Glenn Stracher, associate professor of geology at East Georgia College in Swainsboro, Georgia. "The catastrophe that we're faced with is the fact that these fires are emitting noxious gases." In fire-plagued regions such as in Centralia, Pennsylvania, he says, the ground is littered with sulfur and other pollutants that have killed off virtually all visible plant and animal life.

The impact that these fumes have on human health, however, isn't well understood, says Robert Finkelman, a research chemist for the U.S. Geological Survey who studies coal fires. Although direct exposure to coal smoke in enclosed areas has been linked to arsenism, fluorosis, lung cancer, and other diseases, epidemiologic studies of chronic exposure to pollution from coal fires are not yet available. The very nature of these pollutants will vary from fire to fire, Finkelman says, because a number of factors determine the composition of the fumes, including the composition of the coal, the geology of the area in which it occurs, and the depth of the coal seam.

Coal fires can be ignited as a result of human activities, lightning strikes, or spontaneous combustion, which occurs when coal that is rich in minerals such as pyrite is exposed to oxygen and moisture. The oxidization process raises the coal's temperature until the coal starts to burn. Human activities promote conditions that ignite coal fires, says Stracher. Mining exposes buried coal to oxygen, opens seams to the surface, and produces small particles that combust easily. "Once the dust and rubble catch fire, it spreads to the seam, and finally the coal seam catches fire," says Anupma Prakash, an associate professor of geology and geophysics at the University of Alaska in Fairbanks. In fact, although coal fires have been traced to antiquity, widespread fires trace their origin to the industrial revolution and the coal that powered it.

If left unchecked, coal fires can burn for hundreds or even thousand of years. But, although some industrialized countries have extinguished their fires—most U.S. fires, for example, were extinguished by 1980—underdeveloped countries have lacked the funds or motivation to fight the fires, Prakash says. Before even attempting to fight a fire, funds must be spent to develop a strategy. "Each fire has to be tackled on an individual basis," she says. "There is no general methodology for fighting these fires effectively." Fire-fighting techniques include burying the fire to deprive it of oxygen, building walls to isolate burning sections, saturating the coal with liquid nitrogen, and dousing the coal with water or water-and-soil slurries. But all of these techniques require money, which countries that are rich in coal but short of hard cash are reluctant to spend. "Coal mines usually have no capital to invest in extinguishing these fires," says Rosema. "There are large areas where there is lots of coal burning and nothing is done." A potential source of funds to extinguish these fires may be found in the Kyoto Protocol, which contains a provision for selling CO_2 emission credits. Under such a system, Prakash says, industrialized countries would pay developing countries for the right to emit CO_2. To sell those rights, the developing countries must reduce their CO_2 emissions, which they would do by putting out the fires.–**Scott Fields**

Trouble brewing underground. A collapsing coal seam burns in an open pit mining area in the Rujigou coalfield in China.

Anupma Prakash

The Beat

edited by **Erin E. Dooley**

Agriculture

Fighting Famine with Ancestral Agriculture

Fermented cow's urine may seem an unlikely alternative to pesticides, but it is one of the tried and true pest control strategies favored by Ethiopian farmers in an innovative, bottom-up project run by Save the Children, a British children's charity.

Pests are more than a nuisance in Ethiopia, where agricultural production is also affected by poor soil, severe drought, and soil erosion. The result is food shortages of mammoth proportions, with widespread acute malnutrition and some 6.5 million people dependent on food assistance. Since the fall of the socialist Mengistu government in 1991, the World Bank and Western governments have poured millions of dollars into schemes to improve Ethiopian food production by encouraging farmers to use pesticides and chemical fertilizers.

Hazardous home. Some Ethiopian farmers stockpile chemical pesticides in the family home. A new project aims to decrease pesticide use.

Pesticide supplies are often unreliable, and farmers have lost crops to pest damage when they could not get pesticides to fight infestation. Ignorance of safe handling practices has resulted in accidental poisonings of livestock. Pesticide supplies are often stored in the family home, where they have been used to poison animals in disputes between neighbors and as a means of committing suicide. More than 3,400 metric tons of obsolete pesticides are stockpiled throughout the country under dangerous conditions. "The stocks are characterized by poor storage facilities, very poor stock management, large amounts of pesticides that cannot be identified, and leaking containers that contaminate groundwater and soil," says Kevin Helps, the U.N. Food and Agricultural Organisation's project manager in Ethiopia.

Alarmed at the rising costs of pesticides, the debt-induced economic hardship, and the harmful effects of pesticides on human health and the environment, Save the Children sought an alternative, says John Graham, Save the Children's Ethiopian-based program director. Thus was born the Farmers' Field Schools (FFS) project in Amhara Regional State in the northern highlands. "Previously, the farmers used to get into debt by taking out loans at extortionate interest rates from local wealthy farmers to buy pesticides," says Fantahun Assefa, FFS project coordinator. The FFS fosters the development of inexpensive, locally based, sustainable methods of pest control, drawing on farmers' traditional knowledge of pest management techniques. Since 1999, 480 farmers have been trained. "The main focus is to promote and experiment with alternatives to synthetic pesticides, particularly via the rescue and critical assessment of indigenous methods based on botanical preparations, cow's urine, physical pest control options, and plant-derived extracts," says Fantahun. More than 22 preparations have been tested, including fermented cow's urine, neem leaves, and sisal.

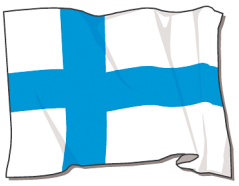
"The Farmers' Field Schools approach started in the late 1980s in the Far East and is being adapted and used under African conditions," says Malcolm Iles, senior social scientist at the Natural Resources Institute, University of Greenwich, United Kingdom. "They are a well-tried method for training farmers to understand what's happening with their crops, to recognize beneficial insects and pests, and to empower them to make their own decisions, not just to see pesticides as a cure-all."

The project in Ethiopia has been hugely successful, with farmers from other villages coming to learn from the graduates. Pests have been controlled and crop yields improved. Pesticide use has dropped and attitudes have changed. Fantahun says, "The farmers seemed to have more trust in expensive foreign technology than their own experiences. Now they are seeing the rewards of their own solutions. Involvement in FFS has increased farmers' available income, boosted their confidence, and given them the ability to make better and more independent decisions in farm management."

Save the Children is disappointed by the low participation of women and younger farmers in the FFS and intends to encourage greater representation in the future. However, the future of the project is unclear. Fantahun recommends continuing the project so that the results can be shared across the region's 15 million people. A grant of more than $1 million from the European Union for that purpose was cut because of a bureaucratic blunder, but Graham is optimistic: "Funding is being reconsidered by the EU, and the Dutch government is considering a one year bridging loan." Training events at regional and national levels are underway to facilitate a gradual transfer of skills to staff in governmental and nongovernmental organizations.**–Lisa Saffron**

Finnish Finish First

In the 2002 *Environmental Sustainability Index*, which ranks the environmental performance of 142 countries, Finland was ranked first and Kuwait last. The United States placed 45th.



Compiled annually by Yale and Columbia universities, the report states that the more corrupt a government is, the less likely it is to make environmental issues a priority and that despite claims to the contrary, better economic development in a country does not necessarily mean a better environment. The ranking of the United States was linked to its "inadequacies in controlling greenhouse gases and reducing waste." Much of the 301-page report focuses on the need for more reliable data in most countries.

What Llama Doo Can Do

Llama droppings are a key component of a natural water regeneration technique adapted for use in the Bolivian Andes, where runoff from abandoned silver and tin mines is creating problems in the capital, La Paz. The extremely polluted water is used untreated for household and agricultural purposes by many of the city's low-income residents, and toxicants such as cadmium have made their way into treated drinking water at concentrations well above limits established by the World Health Organization.

The technique, developed by scientists at Newcastle University in Great Britain, directs the metal-laden water through a series of tanks filled with layers of limestone gravel under a half-meter of llama droppings. Bacteria living in the organic matter use dissolved sulfates, found in abundance in the mine water, as an energy source, which produces sulfides, which react with the dissolved metals and trap them.

Salad Sanitation

A recent study has found that *Escherichia coli* O157:H7 can enter lettuce grown with soil or water contaminated with the bacteria. *E. coli* can enter through the plant's root system and disperse throughout the leaves, where it is protected from cleaning procedures used by growers. The study was conducted in part to establish why surface-sanitizing treatments have often been ineffective in removing *E. coli* from vegetables and fruits. The study researchers, from Rutgers University, stated that even a low level of contamination could present a significant human health risk, because the infective dose of this bacteria is fewer than 1,000 cells. Over 8% of dairy and beef cattle are estimated to have the pathogen present in their systems.

Top to bottom: Art Explosion; World Bank; PhotoDisc

PESTICIDES

Coca-Killing Controversy

As Colombia's cocaine production rises, new questions are arising about a U.S.-sponsored aerial herbicide spraying campaign to eradicate coca, the raw material for cocaine. The spraying, part of Plan Colombia, is carried out by the Colombian government with support from a $1.3 billion, two-year U.S. aid package that was approved in 2000. The package includes more than $320 million for social and economic development and $750 million to train and equip counternarcotics battalions.

During 2001, 84,250 hectares of coca were sprayed as part of Plan Colombia, according to the State Department's *2001 International Narcotics Control Strategy Report*. Nonetheless, a department representative speaking on a background basis admitted that coca plantings rose by 33,600 hectares between 2000 and 2001, to 169,800 hectares total.

That number may overstate actual production, because some fields were subsequently destroyed, but it also indicates the problem's severity. "The increase in cultivation is troubling, as it underscores the pervasiveness of cultivation and trafficking in Colombia, and the magnitude and complexity of Colombia's interrelated problems of security, narcotics control, and economic challenges," says the State Department representative. In addition, last winter saw a resurgence of Colombia's long civil war: In February, the government abandoned negotiations with the principal guerilla group, the FARC, and started spraying in guerilla-controlled territory. (This territory is once again under government control.) Beyond efficacy of the spraying, questions about environmental and health effects arise. Although the herbicide is the relatively nontoxic glyphosate (trade name Roundup), concerns have arisen over additives that improve spraying effectiveness. Additives have not been tested for safety in combination with glyphosate, charges Margaret Reeves, staff scientist at Pesticide Action Network North America. These surfactants, she says, are "designed to increase penetration into plants or other beings. They definitely increase the hazardousness of glyphosate, but we don't know the extent. There is a lack of information." The State Department denies that any human-health impacts are definitively linked to spraying.

Because glyphosate is deadly to virtually all green plants, the spraying has also killed both food crops and the alternative crops that Colombia is promoting to reduce dependence on coca. Last July, Klaus Nyholm, director of the U.N. Office of Drug Control in Colombia, condemned the spraying as "inhuman" for targeting small farmers. According to a 25 July 2001 report in the *St. Petersburg Times*, Nyholm called for an international audit of the program.

Reporting on a January 2002 visit to Colombia's Amazon forest, Phillip Cryan, a former intern for Pesticide Action Network North America, described one family that had taken out three separate loans to spend $10,000 to plant a pepper field that was then fumigated in December. The field, Cryan says, "was crisp, crinkly, black, totally destroyed." The State Department counters that "most cases of spraying of legal crops occur when farmers have planted legal crops within or adjacent to coca or opium poppy. And since planting coca and poppy is illegal, these crops are subject to spraying whether or not [legal] crops are planted in or around them."

Cryan also related charges from villagers that Colombia's government had reneged on a promise to give agricultural aid to farmers who manually eradicate coca. "It was pretty overwhelming to meet people who had put good faith in the government, were trying make the transition from illicit crops to food crops, and suddenly the planes came over, and it was all destroyed."

The State Department, which is taking the lead in U.S. assistance to Plan Colombia, says pilots fly between 50 feet and 150 feet above the ground—essentially at treetop level—to reduce drift and collateral damage. It adds that some complaints originate with drug farmers who are losing money from the spraying. "Some of these reports have been based on unverified accounts by farmers whose illicit crops have been sprayed," states a November 2001 fact sheet of the Bureau of International Narcotics and Law Enforcement Affairs. The government of Colombia does have a compensation process for instances of accidental spraying that was recently revamped with help from the U.S. government.

Some critics have charged that coca eradication accelerates rainforest destruction. Most of the people who were fumigated "had either moved to the city or had moved further into the Amazon to tear down more forest to plant coca," Cryan says. "That's a pattern that is very widespread in response to fumigation, since there are not alternatives for farmers."

The State Department counters that drugs, not herbicides, are causing environmental havoc. "To grow coca, you have to cut down rainforest," the department representative says. "The environment is being destroyed, people are getting sick because coca growers are using [toxic herbicides] to grow coca. All sorts of nasty chemicals are used to process coca."**–David Tenenbaum**

A problematic solution. A farmer in Colombia displays the remains of legal crops that were inadvertantly sprayed with herbicides as part of a U.S.-backed program by the Colombian government to destroy coca crops.

Witness for Peace

The Beat

Protected Harvest

Sales of organic food are growing rapidly, with nearly $26 billion sold in 2001 in the United States alone, according to the industry research and marketing firm Organic Monitor. By 2008, sales worldwide are projected to near $80 billion. Growth in this area will be aided by new national standards for organic production recently adopted in the United States and Canada.

More and more farmers encouraged by this growth are converting to organic farming methods. Between 1992 and 1997, the acreage devoted to organic crops doubled in the United States. Farmers are making this switch in an effort to lower production costs and receive higher prices for their products, according to the U.S. Department of Agriculture's Catherine Greene. Organic farmers can receive double the price for their crops of several fruits and vegetables compared with conventionally produced products, for example, 60% more for organic milk and 34% more for organic cotton.

Founded in 1996, Protected Harvest is a partnership developed between the World Wildlife Fund (WWF), the Wisconsin Potato and Vegetable Growers Association, and the University of Wisconsin. Protected Harvest is working to strengthen consumer confidence in ecologically grown produce and to develop ways to make these methods of farming economically viable for farmers. Not technically an organic program, Protected Harvest advocates use of biologically based crop and soil management practices as a means of reducing toxic pesticide use. Use of these practices, also known as biologically integrated pest management, also improves water and soil quality and helps protect habitat for wildlife.

Protected Harvest's web site, located on the Internet at **http://www.protectedharvest.org/**, outlines the programs the group has developed. The Standards page provides an overview of the production and toxicity standards that Protected Harvest has developed over a five-year trial period and has implemented as a requirement for certification. The production standards cover nine management areas, including field scouting, pest management decisions, soil and water quality, storage management, and weed, disease, and insect management. To achieve certification, growers must accumulate points of each of these areas. Some practices are mandatory, and some practices, such as the use of certain experimental practices, can earn growers bonus points.

Growers, crop consultants, scientists, and environmentalists devised Protected Harvest's pesticide toxicity index, which compares, on a pound-for-pound basis, the active compounds in all pesticides it has approved for use to determine potential risks to humans, wildlife, and the environment. The index has four components: acute mammalian toxicity, chronic mammalian toxicity, ecotoxicity, and impacts on beneficial organisms and resistance management. Toxicity guidelines have also been set to minimize the amounts of high-risk pesticides applied in any field in a single year. All growers who qualify for the program agree not to use 12 highly toxic pesticides. Included in the list of excluded pesticides are aldicarb, disulfoton, oxamyl, and paraquat.

The program's certification process is outlined on the page of the same name. Also provided on this page is a link to the web site of the third-party company that certifies and audits all the information submitted by growers in their applications for admission to Protected Harvest.

The About Us page has information about the three collaborating organizations that founded Protected Harvest, including links to their web sites and brief background descriptions. The WWF has found the partnership to be so successful that it has allowed its logo to be used on the Protected Harvest eco-label that has been developed as a marketing tool for products grown by approved growers. This is the first time the WWF has allowed its logo to be used in such a manner.–**Erin Dooley**

Green Light for Gulf War Panel

The U.S. Department of Veterans Affairs (VA) announced on 23 January 2002 the formation of an 12-member advisory panel to investigate the illnesses suffered by an estimated one in seven veterans of the Gulf War. The panel is charged with promoting and reviewing research and making recommendations to VA officials.

"Gulf War syndrome," as it has come to be known, produces such symptoms as muscle and joint pain, fatigue, nausea, and balance problems. In the first official announcement of a scientific link between Gulf War service and a specific disease, the VA said in December 2001 that Gulf War veterans are also nearly twice as likely to develop Lou Gehrig's disease.

Brownfields Law Passed

After nine years of lobbying by the nation's mayors, Congress signed a law on 11 January 2002 providing up to $250 million per year over the next five years for brownfield assessment and cleanup. Over 500,000 such sites are expected to be eligible. The money is directed at grants for state and local governments to develop programs and includes a funding provision to encourage reclamation of land for public uses such as parks.

Advocates of the law are pleased that it addresses the differences between brownfield and Superfund sites and that it removes restrictions that prevented cities and other eligible entities from providing cleanup grants. It is hoped the new initiative will spur urban revitalization and help slow urban sprawl.

Razing the Rainforest for Drugs

Illegal cultivation of coca, the source crop of cocaine, is destroying large areas of Colombia, Peru, and Bolivia, including many acres of Amazon rainforest. At a U.S. State Department briefing on 28 January 2002, spokesperson Rand Beers stated that an estimated 2.3 million hectares of rainforest have been razed for coca farming in the last 20 years, amounting to almost 25% of the total deforestation that has occurred in Peru's Amazon Basin during the 20th century.

Aside from the large-scale clearing of vegetation to make room for fields, the coca growers use large amounts of toxic pesticides, including paraquat and parathion, which contaminate water sources including the Amazon and Orinoco rivers, and are harmful to humans and wildlife. Beers stated that in Peru alone, 346 metric tons of pesticides are used annually by coca growers.

Top to bottom: Corbis; Protected Harvest; Digital Vision